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Adjunctive heat therapy improves short-term pain and functional outcomes in low back pain

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Abstract

Background: Low back pain is a common musculoskeletal condition associated with pain, functional limitation, and reduced quality of life. NSAIDs are widely used as first-line therapy, while superficial heat is recommended as a supportive non-pharmacological intervention. **Aim:** To compare the effectiveness of NSAIDs plus heat therapy versus NSAIDs alone in improving pain and functional outcomes in patients with acute and subacute low back pain.

Methods: This prospective comparative study was conducted at Father Colombo Institute of Medical Sciences, Warangal, from June to September 2025. Adult patients with low back pain of less than six weeks' duration were allocated into two groups: NSAIDs alone and NSAIDs plus superficial heat therapy. Outcomes were assessed at baseline and after 2–3 weeks using the Visual Analogue Scale (VAS), Oswestry Disability Index (ODI), and straight-leg raise (SLR) test in patients with radicular pain.

Results: Both groups showed significant improvement in VAS and ODI scores. The NSAIDs plus heat therapy group demonstrated significantly greater reduction in pain and disability compared to the NSAIDs-alone group. Patients with radicular symptoms also showed superior improvement in SLR angles with combination therapy.

Conclusion: Adding heat therapy to NSAIDs provides superior short-term pain relief and functional improvement compared to NSAIDs alone in low back pain management.

Key words: Low back pain, Heat therapy, NSAIDs, Visual analogue scale, Oswestry Disability Index

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Introduction

Low back pain (LBP) is among the most frequent musculoskeletal complaints in adults and is a leading cause of pain-related disability and short-term work limitation worldwide [1]. Contemporary clinical practice guidelines consistently recommend non-steroidal anti-inflammatory drugs (NSAIDs) as first-line pharmacological therapy for acute and subacute LBP, while emphasizing non-pharmacological measures to reduce pain and restore function [2, 3]. Superficial heat (heat packs/heat wraps) is widely used in routine care and is supported as a practical, low-cost option that can provide short-term analgesia and improve mobility, potentially complementing NSAID-mediated anti-inflammatory effects [3, 4]. However, in real-world outpatient settings, the incremental benefit of adding heat therapy to standard NSAID treatment over a short follow-up (2–3 weeks) remains under-evaluated using validated outcomes such as VAS and Oswestry Disability Index (ODI) [5]. With this a study was taken to compare the effectiveness of heat therapy plus NSAIDs versus NSAIDs alone in reducing pain and disability in adults with LBP over 2–3 weeks.

Methods

This prospective comparative study was conducted at Father Colombo Institute of Medical Sciences, Warangal, from June 2025 to September 2025. Adult patients aged 18–60 years presenting to the outpatient department with acute or subacute low back pain of less than six weeks' duration were consecutively screened for eligibility. Patients with red-flag signs (history of trauma, fever, malignancy, neurological deficit, cauda equina symptoms), prior spinal surgery, inflammatory back disease, pregnancy, or known intolerance to NSAIDs were excluded. After obtaining written informed consent, eligible participants were enrolled and allocated into two comparative groups using a simple alternate allocation method. Group A received NSAIDs alone, while Group B received NSAIDs plus superficial heat therapy. Baseline demographic and clinical data, including age, sex, occupation, duration of pain, presence of radicular symptoms, and baseline pain severity, were recorded using a structured case record form.

The intervention protocol was standardized for both groups. Participants in Group A were prescribed an oral NSAID (diclofenac 50 mg twice daily or an equivalent agent based on clinician discretion) for up to three weeks, along with advice on activity modification and back care. Participants in Group B

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received the same NSAID regimen in addition to supervised superficial heat therapy. Heat therapy was administered using a reusable hot pack applied to the lumbar region for 20 minutes, twice daily, for a minimum of 10 days and up to three weeks. Patients with radicular symptoms underwent a baseline straight-leg raise (SLR) test performed by a trained clinician. Compliance with medication and heat therapy was reinforced through verbal instructions and reviewed at follow-up visits. Any adverse events related to NSAIDs or heat application were documented throughout the study period.

Outcome assessment was performed at baseline and at the end of the 2–3 week follow-up period by an investigator not involved in treatment allocation. Pain intensity was measured using the VAS, disability was assessed using the ODI, and improvement in SLR angle was documented in patients with radicular pain. Data were entered into a password-protected database and analyzed using SPSS 21. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Within-group comparisons were performed using paired t-tests, and between-group differences were analyzed using independent t-tests or chi-square tests as appropriate. A p-value of <0.05 was considered statistically significant.

Results:

A total of 100 patients with acute or subacute LBP were included and evenly distributed between the two treatment groups. Baseline demographic and clinical characteristics were comparable, with no statistically significant differences between groups (Table 1). Both treatment modalities resulted in significant improvement in pain and functional status over the 2–3 week follow-up period. However, patients receiving NSAIDs combined with heat therapy demonstrated a significantly greater reduction in pain intensity as measured by VAS compared to those receiving NSAIDs alone (Table 2). The mean decrease in VAS score was −4.0 in the combination group versus −2.6 in the NSAIDs-alone group ($p < 0.001$). Functional disability assessed by the ODI also improved in both groups, with a markedly greater reduction observed in the group B (−21.5 vs −13.4; $p < 0.001$), indicating superior functional recovery (Table 3). Among patients presenting with radicular symptoms, improvement in SLR angle was significantly higher in the combination therapy group, suggesting enhanced neural mobility and symptom relief (Table 4).

Discussion:

In this prospective comparative study, both treatment arms showed meaningful short-term improvement in pain (VAS) and function (ODI) over 2–3 weeks, which aligns with the natural favorable course of many acute/subacute LBP episodes when patients remain active and receive symptomatic care [6, 7]. However, adding superficial heat therapy to NSAIDs produced significantly greater reductions in VAS and ODI than NSAIDs alone, suggesting an additive benefit on early analgesia and functional restoration [8, 9]. This pattern is consistent with guideline syntheses that position NSAIDs as a preferred short-term pharmacologic option for acute/subacute LBP and support non-pharmacologic measures such as superficial heat for symptom relief [3, 8]. Contemporary overviews of pharmacological evidence also indicate that NSAIDs can reduce pain in acute LBP, though effect sizes are often modest and vary across populations and dosing regimens [2]. Therefore, a simple adjunct like heat if safe, affordable, and feasible may be clinically valuable in real-world outpatient settings where rapid pain reduction helps maintain mobility and limits disability [6, 7].

The superior improvement observed with heat plus NSAIDs is biologically plausible and supported by earlier evidence that superficial heat can provide short-term reductions in pain and disability in acute LBP [9, 10]. Proposed mechanisms include increased local blood flow, reduced muscle spasm, improved connective tissue extensibility, and neuromodulatory effects (e.g., gating of nociceptive input and altered pain perception), which may complement NSAID-mediated suppression of inflammatory pathways [10]. Although high-quality recent RCTs specifically isolating heat modalities are relatively fewer compared with drug trials, systematic summaries and guideline statements continue to acknowledge superficial heat as a reasonable first-step, non-invasive option particularly for acute presentations where fast symptomatic benefit supports activity continuation [8, 11]. Importantly, the clinical "signal" in our results was seen not only in pain scores but also in disability reduction, reinforcing that heat may facilitate functional gains beyond analgesia alone, especially when patients avoid bed rest and maintain gentle activity [3, 6].

Disability outcomes measured by ODI improved more in the combination group, which is relevant because ODI is a widely used, condition-specific measure for spine-related functional limitation and is commonly employed in both clinical trials and routine practice [12]. Measurement work suggests that ODI is responsive, but interpretation should consider thresholds for meaningful change and the presence of measurement error across populations and settings [13]. In our cohort, the between-group difference in ODI reduction over 2–3 weeks suggests that heat therapy may accelerate short-term functional recovery when added to NSAIDs, potentially reducing work limitation and improving daily activity earlier in the clinical course [6, 7]. Likewise, in the radicular subgroup, greater SLR

improvement with heat plus NSAIDs may reflect reduced protective muscle guarding and improved tolerance to neural tension, although sciatica-specific evidence for nonpharmacologic adjuncts remains mixed and often limited by heterogeneity [9, 11]. Overall, these findings support a pragmatic multimodal approach pairing an evidence-supported analgesic (NSAID) with a low-risk adjunct (heat) rather than relying on medication alone for early symptom control [2, 3].

From a clinical applicability standpoint, this combined strategy aligns with the "stepped care" logic recommended in many LBP resources: start with education, reassurance, activity advice, and low-intensity nonpharmacologic options, and use short courses of NSAIDs when medication is required [6 – 8]. NSAID effectiveness has been demonstrated across multiple acute LBP contexts, and contemporary trials continue to explore NSAID formulations and combinations aiming for faster relief and better mobility outcomes [2, 14]. For example, recent controlled studies in LBP have assessed diclofenac-based regimens and formulations, generally supporting short-term pain improvement while underscoring the need for individualized selection and monitoring [14, 15]. Heat therapy offers practical advantages in outpatient care—rapid onset of comfort, minimal training requirements, and patient acceptability—while also potentially lowering reliance on escalating analgesic regimens, a goal reflected in broader primary-care efforts to emphasize non-drug strategies and opioid stewardship [8]. Safety remains central: NSAID use requires attention to gastrointestinal, renal, and cardiovascular risks, and heat application requires counseling to prevent thermal injury, particularly in patients with impaired sensation or dermatologic vulnerability [2, 10].

This study also had limitations that should temper interpretation and guide future work. Allocation was pragmatic rather than fully randomized and blinded, so expectation and performance effects could have contributed to larger improvements in the heat arm, especially for subjective outcomes like VAS [6]. Follow-up was short (2–3 weeks), preventing conclusions about recurrence, sustained disability benefit, or transition to chronic pain, which is clinically important in LBP trajectories [6, 7]. Adherence to home heat sessions can vary and was assessed pragmatically rather than through objective monitoring, introducing potential exposure misclassification [8]. Future studies at similar centers could strengthen evidence by using concealed randomization, standardized NSAID dosing, objective adherence checks (e.g., logs or device timers), stratification by radicular symptoms, and longer follow-up (6–12 weeks) to capture sustained functional outcomes and healthcare utilization [3, 13]. Even so, within real-world constraints, our findings support the routine clinical impression that adding superficial heat to NSAIDs can provide superior short-term pain relief and functional improvement in acute/subacute LBP compared with NSAIDs alone [8 – 10].

Conclusion: In this prospective comparative study, both NSAIDs alone and NSAIDs combined with heat therapy were effective in reducing pain and disability in patients with acute and subacute low back pain over a short follow-up of 2–3 weeks. However, the addition of superficial heat therapy resulted in significantly greater improvement in pain intensity, functional disability, and straight-leg raise among patients with radicular symptoms. Heat therapy is a simple, low-cost, and safe adjunct that enhances the short-term effectiveness of NSAIDs. Incorporating heat therapy into routine outpatient management of low back pain may accelerate recovery and improve functional outcomes.

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Table 1: Baseline characteristics of the study participants

Parameter	Group A	Group B	P value
Mean age (years)	42.6 ± 9.8	41.9 ± 10.2	0.71
Male, n (%)	28 (56%)	30 (60%)	0.68
Duration of pain (days)	18.4 ± 6.2	17.9 ± 6.5	0.66
Radicular pain, n (%)	22 (44%)	24 (48%)	0.69

Table 2: Comparison of VAS scores among the study members

Group	Baseline	Follow-up	Change	P value
A	7.1 ± 1.0	4.5 ± 1.2	−2.6 ± 1.1	—
B	7.2 ± 0.9	3.2 ± 1.1	−4.0 ± 1.0	<0.001

Table 3: Comparison of ODI in % among the study members

Group	Baseline	Follow-up	Reduction	P value
A	46.2 ± 8.5	32.8 ± 7.9	−13.4 ± 6.1	—
B	45.6 ± 9.1	24.1 ± 7.2	−21.5 ± 6.4	<0.001

Table 4: SLR improvement in radicular pain subgroup

Parameter	Group A (n = 22)	Group B (n = 24)	P value
Baseline SLR angle (°)	41.5 ± 6.8	40.9 ± 7.1	0.78
Follow-up SLR angle (°)	52.3 ± 7.4	61.8 ± 8.0	0.002
Mean improvement (°)	+10.8 ± 5.2	+20.9 ± 6.1	<0.001